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Filling-up the Time Sheet

It is characteristic of statistics that they breed like rabbits, and their fecundity probably designates original worth. The foundry industry prior to the war had only the census of production upon which to assess its own importance. Nowadays, it uses its statistics in its negotiations with Government departments and quite often, to reinforce an argument, more and more detailed figures are required. Where extra details are found necessary, there is much evidence reflected to the value of the initial work. The rapid availability of statistics undoubtedly enhances their worth, and when a founder notes over-all increases or decreases in production, he can ascertain whether his own output is satisfactory or requires attention. For the successful management of any industry, resort must be had to statistics of various kinds. The foundry manager must know the actual and potential volume of orders so that he can arrange for flow production. Conversely, the sales manager has to be provided with statistics of current production. Before major alterations are carried out or new plant introduced, the management require to know statistically the import of the proposals. Because of market changes, investigations have to be made as to what action must be taken —all involving statistics of past performance.

There are other types of statistics established at the expenditure of much time and effort, which on completion have no practical application. We have in front of us an eleven-page document issued by the British Institute of Management covering " Labour Turnover." The cases of over 300,000 people have been investigated and entered under 20 main headings. We have honestly tried to draw some useful conclusions from this mass of statistics but have to record a complete blank. We are told the percentage of people who leave after less than one month, three months, or a year, and those after longer service. In the industries with which we have been concerned there has always been a category of labour regarded as " casual." This factor is recognised by at least one of the chocolate firms for all general labour on hiring is put on a 12 months' probation. Then we learn that the oil and petroleum trade has the lowest turnover, but that does not help a building contractor who has the heaviest. Again, we now know the reasons given for each resignation or dismissal, but such knowledge will not prevent Mary from getting married, or George from being called up for service in the Forces, or even from getting a better job.

We are afraid that all that can be done with this monumental piece of work is to " let it lie on the table," leaving the statistically-minded to wonder how many man-hours have been expended in its production. By all means let industry have its statistics, but before their production is started their usefulness should be established. The moral of this old story has still to be learnt. The management of a jobbing foundry wishing to find the exact cost of each casting, issued to each moulder a time sheet upon which he had to enter the time spent on each job. One card completed by a Cockney read: " Job No. 365/72—30 mins.; Job No. 843/27/49—22 mins." and so forth, but at the end was the phrase " Filling in the blarsted card—20 mins."

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Leaders of the Industry (New Series) No. 1

Mr. Frank W. Rowe

At the Annual General Meeting of the British Steel Founders' Association, Mr. Frank W. Rowe, B.Sc., F.I.I.A., was elected Chairman. Mr. Rowe is managing director of K. & L. Steelfounders & Engineers, Limited. K. & L., in addition to operating one of the largest steel foundries of this country, have extensive engineering shope devoted to the manufacture of mobile cranes, steam engines, air compressors, and small petrol engines.

Now 51 years old, Mr. Rowe was educated at Manchester Grammar School and Manchester University. He started his engineering career as a foundry apprentice at Metropolitan - Vickers. His first job was ramming up lightening cores for bedplates from an odoriferous and somewhat insanitary core sand known now only to the older generation. Since that time he has had considerable experience of steel, cast-iron, and non-ferrous founding in several well-known engineering establishments in this country, and he has been responsible for the building of new, and the modernising of several older foundries. He has been associated with the pioneer work for many improvements in methods and technique in British foundry practice, including the centrifugal casting of both bronze and steel, particularly in vertical-axis machines, the introduction of X-rays as an inspection technique for steel castings, the Randupson process of cement moulding, and the production of steel castings for aircraft engines. He has written many Papers on various aspects of foundry and metallurgical practice. Since joining K. & L. Steelfounders & Engineers, Limited, he has supervised the building of new research laboratories, the erection of a new electric steel-melting shop, the installation of a new sand-preparing, -distributing, and -recovery system feeding a large machine-moulding bay, new pattern shops, and several other major plant additions in the foundries there.

MR. F. W. ROWE, B.Sc., F.I.I.A.

Mr. Rowe has been a member of the executive council of the British Steel Founders' Association since 1944, and has served on numerous committees. He was a member of the Townsend Committee in 1943, and has been chairman of the "health-in-steel-foundries" committee for the last two years. He was chairman of the steering committee which arranged the recent successful productivity conference. Mr. Rowe is a Freeman of the City of London and a liveryman of the Worshipful Company of Founders, which was founded in 1365. He has been a member of the Institute of British Foundrymen since 1922.

British Standards Institution

The British Standards Institution's monthly information sheet for November lists, under "New Standards Issued," B.S. 1121A:1949, Laboratory safety precautions in metallurgical analysis (1s.); B.S. 1121 (Methods for the analysis of iron and steel), Part 15:1949, Silicon in plain carbon steels, low-alloy steels and cast irons (1s.); B.S. Part 16:1949, Manganese in iron and steel (1s.); B.S. 1575:1949, Cast-iron pipe flanges and flanged fittings, class 125, for the petroleum industry (7s. 6d.); B.S. 1576:1949, Cast-iron pipe flanges and flanged fittings, class 250, for the petroleum industry (7s. 6d.); and B.S. 1599:1949, Identification numbers for cylinders of internal combustion engines (2s.).

This last-named Standard provides for the identification of the cylinders of internal combustion engines for marine, stationary and vehicular use, including aircraft engines. It defines primary and secondary driving ends, bank, and row, and states how cylinders in banks shall be numbered, and how banks shall be lettered. The textual matter is supported by eleven diagrams illustrating the application of the standard numbering to various types of engines.

Under the heading "Future Publications," there are:—B.S. 628-632 and B.S. 650-656:1949, Vegetable oils (6s.); B.S. 876:1949, Hand hammers (3s. 6d.); B.S. 1570:1949, Flanged steel plug valves for the petroleum industry (7s. 6d.); and B.S. 1615:1949, Anodic oxidation finishes for aluminium and aluminium alloys (3s.).

The founder is always like a chimney sweep, covered with charcoal and distasteful, sooty smoke, his clothing dusty and half burned with fire, his hands and face all plastered with soft, muddy earth. To this is added the fact that for this work a violent and continuous straining of all a man's strength is required, which brings great harm to his body and holds many definite dangers to his life. In addition this art holds the mind of the artificer in suspense and fear regarding its outcome and keeps his spirit disturbed and almost continually conscious. For this reason they are indeed called fanatics and are despised as fools. But with all this it is a profitable and skilful art and in large part delightful.

—An extract from "Pirotechnia," by Vannoccio Biringocci, written in 1540.

A HIGH-VACUUM ELECTRIC-ARC melting furnace has been designed and fabricated by National Research Corporation, Cambridge, Massachusetts. The furnace has been set up at Battelle Memorial Institute, where it will be used particularly in studying molybdenum and its alloys.

Ferrous Melting Furnaces in the United States and Canada*

By A. W. Gregg†

The foundry has been a vital factor in the industrial development of the United States. Foundries have been obliged to expand and to mechanise all possible operations in order to satisfy the growing demands of industry, particularly the railways, motor-vehicle plants, builders of agricultural machinery, the mining industry, the public utilities, and the manufacturers of plumbing, heating, and sanitary ware. Even the American housewife has helped to create a market for castings by demanding ever newer and better stoves, kitchen utensils, refrigerators, washing machines, electric irons, vacuum cleaners, fans and other household appliances.

The great distances in the United States from north to south and from east to west have created tremendous transportation problems necessitating thousands of miles of railways and millions of motor-cars, buses, and lorries. The great central area, with its large-scale farms, could not be operated efficiently without mechanised farm machinery like tractors, harvesting machinery, lorries and various kinds of soil-tilling machinery.

According to a recent survey conducted by the "Foundry" magazine, the total number of foundries (ferrous and non-ferrous) in the United States and Canada in 1948 was about 6,000. This represented an increase from 1945 of 424 foundries. The growth of the industry reflects the tremendous demands for castings which have developed during the reconversion period, but the substantial increase in the total number of foundries does not tell the complete story of the expansion which has taken place.

Increased Capacity

Due to a heavy demand for castings and a continuation of the man-power difficulties that developed during the war, many foundries have mechanised and modernised operations, and in so doing have increased the productive capacity of individual plants. Considering both the increase in number of plants and added capacity provided by modernisation, it seems probable that the foundry industry in America now has facilities to produce a greater tonnage of castings than ever before in its history. The capacity of all foundries is estimated at about 14 million tons of castings per year. The industry employs some 400,000 people, and the annual payroll is about one and one-quarter billion dollars. The total annual value of castings produced in the United States is something over four billion dollars.

The influence of the American Foundrymen's Society has been most constructive. Co-operative research and exchange of information have had a tremendous influence in the development of improved foundry practice, better-quality castings and lowered costs. The Society for over 50 years, through its literature and promotion of exhibits of new equipment, has stimulated the advance of the industry. One of its earliest projects was the development of an apprentice training programme, which has been backed up annually for many years with a contest for moulder and pattern-maker apprentices. The sand-research committee has been in existence for nearly 40 years and has developed standards and methods of testing foundry sands which are internationally acccepted.

Chilled Car-wheel Industry

The manufacture of chilled-iron car-wheels furnishes an excellent example of a highly mechanised foundry serving the railways and specialising in one kind of casting.

In four years—1945 to 1948 inclusive—car-wheel foundries shipped 12,932,000 wheels, having a total weight of 4,304,223 metric tons. This is an average of 1,076,058 metric tons of car-wheels shipped per year.

Car-wheel manufacturers normally receive with an order as many old wheels as the number of new wheels ordered. In effect, they are selling only the cost to convert a used wheel to a new one. Thus, a new 750-lb. wheel sells for about £3 plus the returned 750-lb. old wheel.

Grey-iron Foundry Industry

The oldest and still the largest branch of the foundry industry in America is that manufacturing grey-iron castings. The earliest iron casting made in America was cast in 1642. This was a cooking vessel manufactured by the Saugus Iron Works near Lynn, Massachusetts. The metal was made in a crude blast furnace capable of producing about 8 tons of pig-iron per day. This casting has been preserved and is now the property of the local Chamber of Commerce.

There are 3,457 grey-iron foundries in the United States and Canada, of which 373 are in Canada. These foundries operate 4,979 cupolas, having a total estimated hourly capacity of 33,179 metric tons. Of these foundries, 25 per cent. employ mechanical chargers, and 75 per cent. of the cupolas are still hand charged; 40 per cent. of all cupolas are over 20 years old. About 40 per cent. have sand-testing laboratories, about 30 per cent. have physical-testing laboratories, and about 35 per cent. have chemical laboratories.

*American exchange Paper to the International Foundry Congress, 1949, at Amsterdam.

†Consulting engineer, Whiting Corporation, Harvey, Illinois.

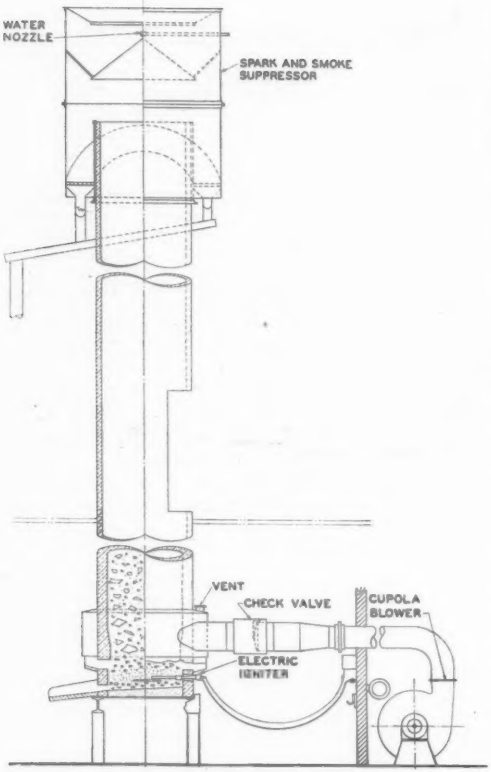


FIG. 1.—SKELETON VIEW OF TYPICAL CUPOLA WITH SUPPRESSER, BLOWER AND ELECTRIC COKE IGNITER.

The Cupola Furnace

The cupola is almost the universal melting unit, and the annual weight of iron melted in cupolas in a good year is 14 million tons. This represents a production of about 10.9 million tons of grey-iron castings.

Cupolas are built with shell diameters of 26 to 130 in. and diameters inside the lining range from 17 to 90 in. or more. Cupola melting capacities are based on 10 lb. per hr. per sq. in. of area inside the lining. Cupolas have melting rates from 1 ton per hr. to 27 to 32 tons per hr. They range in height from 30 to 90 ft. from grade to top of stack. Tuyere area compared with area inside the lining varies from 10 to 25 per cent. The number of tuyeres varies from four on a small cupola to 16 on a cupola having a shell diameter of 130 in. Fig. 1 is a skeleton view of a typical cupola with a suppresser and blower.

At least 75 per cent. of all cupolas are operated with a single row of tuyeres. There are strong advocates for both multiple-row and single-row operation, and good results are being obtained with either system. Cupolas built during the last few years have a greater distance from the base plate to charging door-sill than those made in earlier years. Whereas many old cupolas had (and have) only 12 to 15 ft. for this dimension, cupolas built during the last 15 years have from 15 to 25 ft. from the base plate to the charging door-sill, which is especially true when mechanical charging is employed.

Coke is the favoured fuel. It is almost universally used. During the last two or three years, when coke was in short supply, some foundries used a percentage of anthracite coal, but with rather indifferent results.

Naturally, the melting loss is variable, depending upon the character and cleanliness of the metallic charge. With clean scrap and pig-iron and good operating conditions, the melting loss may be as low as 2 per cent. With oxidised, dirty or light-section scrap, melting loss may be as high as 10 per cent. With a large percentage of steel scrap in the charge, the melting loss will usually be about 6 per cent.

Other Furnaces for Grey Iron

Although the cupola produces about 98 per cent. of all grey iron melted in the United States and Canada, a small tonnage of cast iron is made in electric furnaces, and the greater part of the iron used for chilled rolls is made in open-hearth or air furnaces.

The electric furnace is used for melting special and alloy grades of cast iron. Some of the manufacturers of individually-cast piston rings have always used the electric furnace. Because coke in the United States since the war has been at an all-time high level in cost, and quality has been much below the standard of pre-war years, some grey-iron foundries are considering electric melting, and several have installed small electric furnaces to superheat cupola metal. Duplexing with cupola and electric furnace has an advantage over cold-melt electric furnace practice, because it maintains the advantage of a continuous supply of molten metal.

Cupola/Open-hearth Furnace Duplexing

An interesting application of duplexing has been developed in several non-integrated steel plants. Large cupolas charged with about 75 per cent. steel scrap and 25 per cent. cast-iron scrap, are used to supply hot metal for 35 to 40 per cent. of the open-hearth furnace charge. Cupolas are operated from 75 to 125 hrs. without dropping bottom. Open-hearth furnace production has been increased 30 to 50 per cent. as compared with operation with an all-cold charge. Cupolas are operated at a rate of about 408 tons in 24 hrs. Hot metal is now being produced for less than the cost of pig-iron. This process is especially economical when scrap and coke prices are low and the price of pig-iron is relatively high, which is the case in the United States at present.

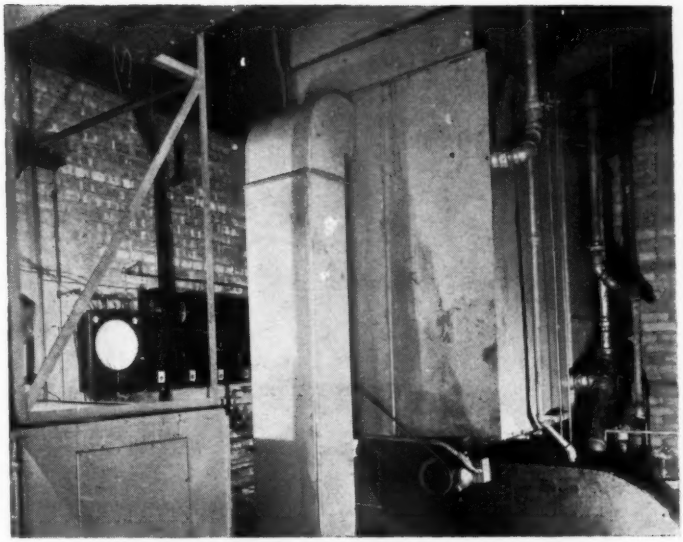


FIG. 2.—DE-HUMIDIFYING EQUIPMENT.
(Courtesy: Surface Combustion Company, U.S.A.

Cupola Blowers

For many years American foundrymen preferred the so-called positive, pressure type of blower, having two cycloidal impellers, but during the last 15 years the rotary or turbo-blower has become very popular. Today, opinion is about evenly divided on the merits of

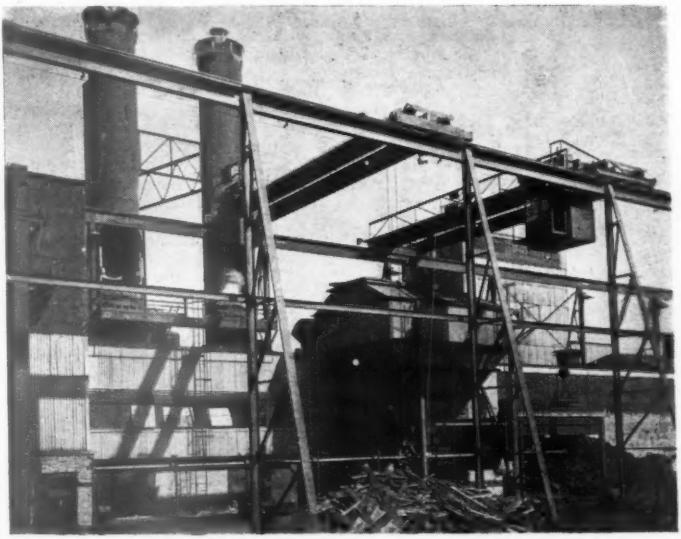


FIG. 3.—INSTALLATION COMPRISING TWO CUPOLAS. CHARGING CRANE (REMOTE CONTROLLED) PLACING CHARGE BUCKET IN CUPOLA. MAKE-UP CRANE WITH MAGNET AT RIGHT. COKE AND LIMESTONE BIN WITH WEIGH-HOPPER, CENTRE.

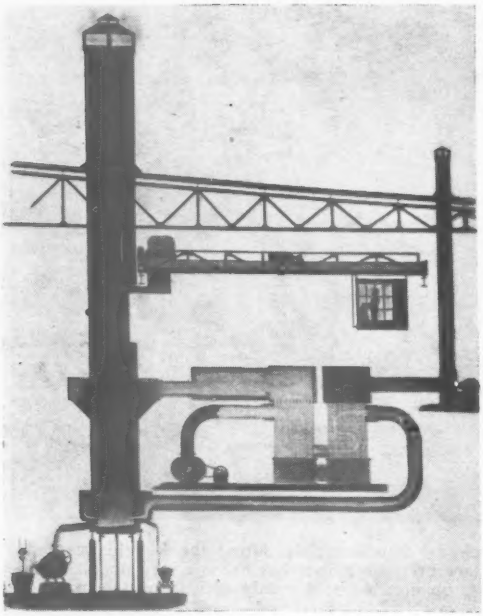


FIG. 4.—GRIFFIN-TYPE HOT-BLAST CUPOLA WITH CRANE CHARGER.

the two types. Small cupolas, up to about 32-in. inside diameter, are usually operated with fan-type blowers. The usual rating for cupola blowers is 2½ cub. ft. per min. per sq. in. of cupola area inside the lining.

Blowers built in earlier years were seldom rated over 20-oz. pressure. To-day, especially for the rotary-type blower, capacities for the larger sizes are figured at 28- to 40-oz. pressure. During the last two or three years, when coke of good density was difficult to obtain, cupola pressures recorded at the windbox were abnormally high.

Air-weight Control Equipment

Automatic air-weight control equipment is now considered essential for good cupola operation. The weight of oxygen and the rate at which it is delivered to the cupola are of greater importance than the volume of air. The weight of air (and oxygen) entering the cupola should be controlled with as great accuracy as is required for other materials of the charge.

For efficient cupola operation, uniform melting conditions are of prime importance, and such conditions cannot be assured by maintaining a constant pressure and volume of the air delivered to the windbox. This is because variations in atmospheric temperature and pressure may cause the weight of oxygen in a given volume of air to vary by as much as 20 per cent.

There are two types of air-weight control equipment and either can do a satisfactory job. One popular type depends upon the drop in pressure through an orifice and the compensating mechanism includes a bellows, whose expansion or contraction under varying conditions of pressure and temperature provides changes in the leverage of the controlling and recording instrument. A butterfly valve in the blast pipe of a rotary blower, or a venting valve in the case of a positive impeller blower, is pneumatically operated by a diaphragm motor.

Another type of air-weight control equipment depends upon a measurement of the phase current on the motor driving the blower, which varies with the weight of air delivered.

De-humidifying Equipment

Several kinds of equipment are now available for drying the air for cupola operation (Fig. 2). The moisture content of air is subject to variation. On a damp day the air required for a 45-ton melt may contain a ton of water, while on a dry day the blast for the same charge will contain only one-sixth of this amount. A uniform percentage of moisture is much to be desired, as this removes an uncontrollable operating variable. Moisture in the air has an oxidising action in the cupola, and the foundry making light-section castings, or chilled work, finds it important to keep the percentage of water to a minimum. The pistoning foundries desire a maximum of 3 grain of moisture per cubic foot of blast. Liquid drying agents are preferred to dry material. A few air-drying installations depend upon refrigeration of the blast.

Equipment for pre-heating the blast is expensive and for a great many years was considered practical only for the large foundry melting at least 100 tons per day. The cost of coke is the most important consideration in determining if such an investment is justified. Hot-blast equipment makes possible coke savings up to 30 per cent. and greatly improves the control of metal composition. Silicon, manganese and carbon losses are definitely reduced. Some companies report a reduction in the cost of refractories.

The most popular design is the Griffin system (Fig. 4), where waste gases from the cupola stack are withdrawn at about eight to ten feet below the charging level. These gases are burned in a combustion chamber and average 12 to 14 per cent. carbon monoxide depending upon the coke ratio. A temperature of 870 to 926 deg. C. is developed in the combustion chamber, and the resultant products of combustion are passed through cast-iron tubes in a 2- or a 3-pass heat exchanger. The air from the blower is circulated around these heated tubes. From the heat exchanger the heated air is delivered to the windbox of the cupola. An exhaust fan with water-cooled bearings furnishes suction for the products of combustion which are delivered to a stack. The temperature of the blast at the windbox is usually 205 to 315 deg. C. This temperature is controlled by the per-

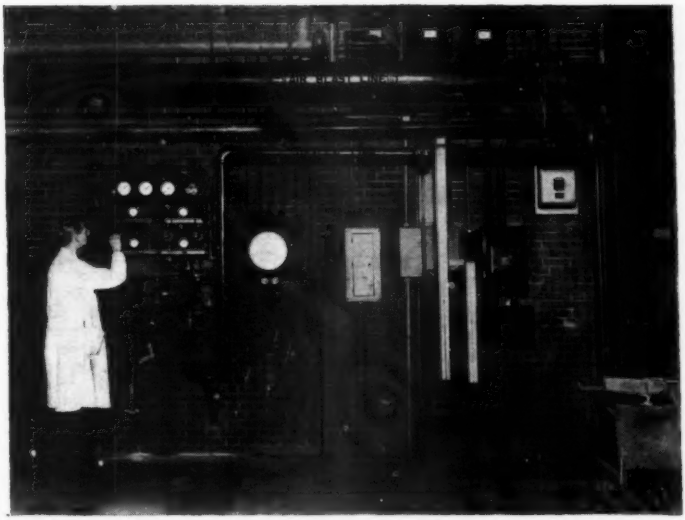


FIG. 5.—CONTROL EQUIPMENT FOR OPERATING EXPERIMENTAL CUPOLA WITH OXYGEN-ENRICHED BLAST.

(Courtesy: Armour Research Foundation, U.S.A.

centage of waste gases withdrawn from the cupola, which ordinarily is about 60 per cent. of the total.

There are 27 hot-blast installations in the United States having inside diameters which range in size from 32 in. to 78 in. Car-wheel foundries using hot-blast cupolas report coke consumption as low as 140 lb. per ton of charge. Metal is tapped at about 1,480 deg. C.

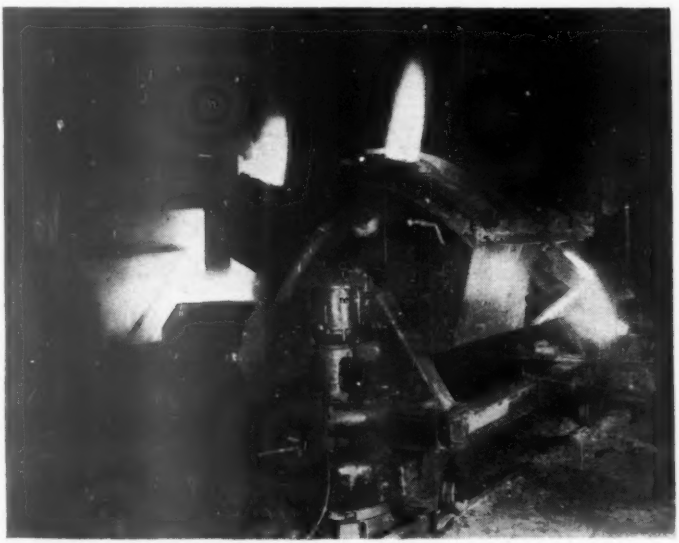


FIG. 6.—3-TON CRADLE FURNACE. FIRED WITH PULVERISED COAL. SMALL PULVERISER IN FOREGROUND HAS A CAPACITY OF 100 LB. PER HR.

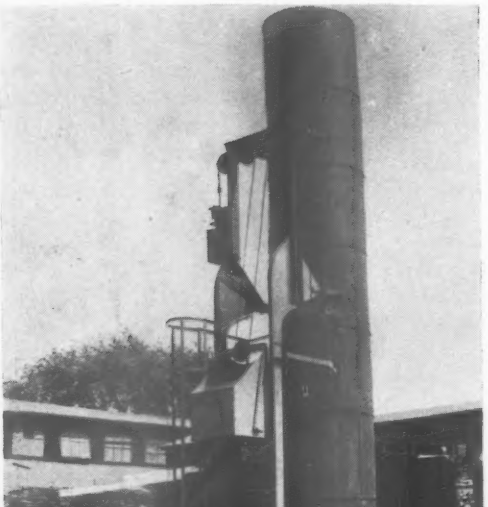


FIG. 7.—VERTICAL SKIP-HOIST CHARGER INSTALLED IN SMALL FOUNDRY. CHARGES MADE UP BY HAND AND MOVED TO SKIP BUCKET IN WHEELBARROWS.

Oxygen Enrichment

Several foundries to-day are experimenting with the use of oxygen mixed with air for cupola operation. About 20 heats of 3 tons each were made at Armour Research Foundation, Chicago. using various percentages of oxygen added to the blast. Control equipment for these experiments is shown in Fig. 5. The composition of the enriched blast varied from 24 to 30 per cent., while coke ratios varied from 8 to 1 to 12 to 1. A quotation from the abstract published with the Armour report reads as follows:—

"Use of oxygen-enriched cupola blasts has proved successful for increasing melting rates and tapping temperatures with a given coke ratio and blast volume. Melting rates have been increased as much as 40 per cent. by adding approximately 14 per cent. oxygen to the blast. Melting and tapping temperature has been raised from about 15 to 85 deg. C. by manipulating the oxygen addition and total blast volume. Savings in coke with no sacrifice in operating conditions are available by the use of oxygen enrichment. Most important of all, oxygen is useful to overcome bridging and cold metal conditions and often can be used to save a heat from freezing in the furnace rather than resorting to dropping the bottom. Oxygen enrichment can be used as a control tool to regulate melting rate and tapping temperature."

Because the cost of oxygen is high unless it is used in considerable quantities, the small foundry cannot afford to use it except as a "help in time of trouble." Foundries having large production—say 1,000 tons per day or more—can, by reason of large quantity consumption, purchase oxygen at fairly reasonable prices. An addition of 3 per cent. of oxygen to the cupola blast will increase temperature and melting rate and save at least 12 per cent. of the coke required.

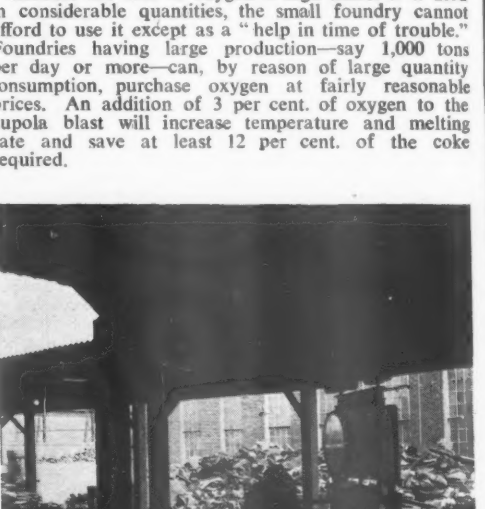


FIG. 8.—BUCKET AND WEIGH SCALE SUSPENDED ON MONORAIL IN STOCKYARD. CHARGES DELIVERED TO VERTICAL SKIP HOISTS.

Balanced Blast Cupola

The balanced blast cupola was developed by the British Cast Iron Research Association, and was introduced into the United States about 1937. Some 60 installations are now in operation, of which 40 per cent. are in foundries in the Southern States. Diameters vary from 27 in. to 61 in. inside the lining. The most successful installations in the United States are in foundries producing soil pipe and pressure pipe. Claims are made for as much as 30 per cent. savings in coke.

The early balanced-blast cupolas in the United States had a primary row of tuyeres and three auxiliary rows. To-day, practically all are operated with only two rows of auxiliary tuyeres. The usual setting for the valves in the tuyeres aims for about 85 per cent. of the total air to be admitted through the primary tuyeres, and 15 per cent. through the auxiliary tuyeres. The area of all tuyere openings is adjustable because of the valve construction. After the best position is determined for the valves, the setting is not changed unless there is a material change in the character of the coke or the metallic charge. The valves in the main tuyeres are provided with a gate which permits closing off any main tuyere without changing the setting. Directions for operating balanced blast cupolas, issued by the B.C.I.R.A., specify that the main tuyeres be closed in consecutive order for a period of 8 to 10 minutes. One reason for closing the tuyeres in this manner is to melt slag obstructions in tuyere opening by utilising the heat inside the cupola and avoiding the chilling action of the blast. If manually accomplished, this operation requires the time of one man and few foundries in America follow this practice.

Balanced-blast cupolas were designed to accomplish more complete combustion of carbon to carbon dioxide with consequent improvement in thermal efficiency. In the balanced-blast cupolas which it has been the Author's privilege to observe, there is a greater oxidation loss of silicon and manganese than in cupolas of conventional design, although some operators claim that the reverse is true.

Cradle Furnace

The cradle furnace used in connection with cupola melting serves as a heated mixing and distributing ladle. Metal temperature can be maintained or slightly increased, and uniformity of composition is greatly improved.

Cradle furnaces are built in sizes ranging from 3 to 25 tons holding capacity. They are usually fired with pulverised coal, as shown in Fig. 6. The tilting mechanism is power operated. Cupola metal can be tapped directly into the cradle furnace, or delivered to it with a ladle, if the cradle furnace is located at some distance from the cupola. The pouring spout is located on one side of the furnace. A pour-in spout and a skimming opening is located on the opposite side. The refractory material used for side walls and roof consists of silica brick or high-temperature-duty clay brick.

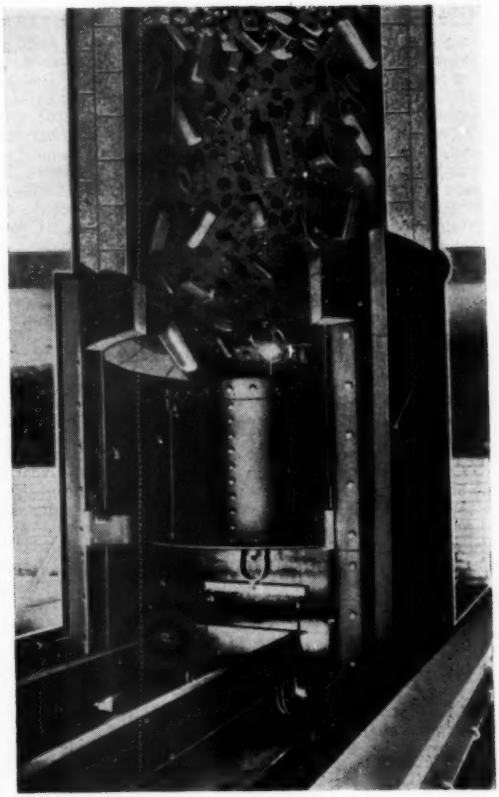


FIG. 9.—CONE-BOTTOM CHARGING BUCKET RESTING ON WISHBONE-SHAPED CASTING-DISCHARGING MELTING STOCK IN CUPOLA.

Monolithic rammed bottoms are popular. Roofs are bung type.

Undoubtedly one of the greatest improvements in cupola operation is due to the introduction of mechanical charging equipment. There are many types, ranging from the simple, vertical skip hoist capable of serving a single cupola (Figs. 7 and 8) and usually employed on smaller sizes, to the elaborate, complete systems serving a number of cupolas of any size (see Figs. 3 and 9).

The make-up system in the stock yard for a complete installation employs a travelling crane with a magnet, an iron loading platform with a weigh hopper, and a coke and stone bin with a weigh hopper, from which these materials are delivered by gravity

Ferrous Melting Furnaces

into the charging buckets. A transfer car is used to move the loaded buckets from the make-up point to the pick-up point under the charging crane. Instead of a travelling crane for charging, some installations employ an inclined skip hoist which may serve one or more cupolas. A completely-mechanised charging installation employs from two to three men and can handle up to 40 tons per hour. In some plants, 20 men or more have been replaced by three. Each installation should be individually engineered to comply with local requirements and conditions. Complete mechanical charging installations not only cut labour costs, but change the job from one that nobody wants, to one that eliminates hard manual labour and provides safer and more pleasant working conditions. It also encourages greater accuracy and better housekeeping.

Dust and Fume Suppressors

Several cities in the United States have set up very exacting specifications for the waste gases discharged during the operation of a cupola. Some codes require a maximum of 4/10 of a grain of solid matter per cub. ft. of waste gas. The double-cone spark arrester, which has been used on cupolas for many years, is inadequate in many localities to meet present-day dust- and fume-control requirements. A foundry in Los Angeles, California, is operating a closed-top cupola having two bells at the top similar to blast-furnace construction. Waste gases are drawn from the side of the stack and passed through a cyclone dust collector and then through a wet collector.

(*To be continued.*)

Darwin's Assured of Support

At a dinner held in Sheffield by Sir Alexander Dunbar (formerly chairman of the English Steel Corporation, Limited), who, together with Mr. E. M. Dodd (financial adviser to Thos. W. Ward, Limited), has been appointed by the board of Darwins, Limited, steel manufacturers, of Sheffield, to advise on policy, following changes in directorship, assurances were given of the "complete goodwill" of Sheffield industrialists towards the company.

The guests, it is reported, promised every help in their power and assured the new management that, for the sake of the good name of Sheffield, they would do everything possible to support the Darwin group.

Foundry Recruitment Problem

That there are still insufficient recruits to the foundry industry in Smethwick, Oldbury and Halesowen is stated in this year's report of Smethwick Youth Employment Bureau. Employers and education authorities in the three areas have a difficult problem to consider. The demand for juvenile workers continues to exceed the supply, and at no time during the year has the Bureau had fewer than fifty vacancies recorded in its files.

New Profits Tax Act, 1949

By F. J. Tebbutt

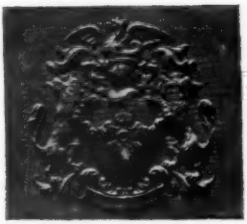
The provisions concerning the Profits Tax have up to now been included in the yearly Finance Acts, but now there has been passed a measure entitled "The Profits Tax Act, 1949," which makes alterations to the scheme. To simplify understanding of this new Act, a brief reference to the main provisions is necessary. Broadly, assessment procedure follows Income Tax (Schedule D business, profits, persons on own account) principles, but there are contrasts in many instances between the two schemes (incidentally, these are separate taxes, but both are chargeable). For instance, for schedule D, income-tax assessments are based on income in the year preceding the year of assessment, *i.e.*, the year ending April 5 each year (or an earlier date—perhaps the previous December 31—according to the year-ending date of the particular firm), payment of tax arising therefrom being made in two equal instalments on January 1 and July 1 in the following year. Profits tax (yearly periods ordinarily) applies to current yearly accounting periods, the tax payable being due one month after the assessment date.

The rate of profits tax at the passing of this new Act was 25 per cent. on profits distributed to shareholders, 10 per cent. on profits placed to reserve or ploughed back into the business, that is, not distributed. Now, by this 1949 Act, the rate of tax on profits distributed is 30 per cent., the rate for undistributed profits remaining at 10 per cent. The new rate is to apply after September 30, 1949, and where an accounting period falls partly before and partly after this date, the old rate will apply for profits arising before September 30, 1949, the new rate on profits arising afterwards, but with the following provisions.

In respect of dividends declared before September 27, the old and lower rate of tax will apply. For dividends declared between September 27, 1949 (the date when the Chancellor of the Exchequer made his statement of increased tax in the House of Commons), and September 30, 1949, the Act lays down that if there has been an increase, the amount of the increase will attract the higher rate (that is, the new rate of 30 per cent.), meaning that the amount will be included with the amount which will be chargeable at the new rate of 30 per cent. A point of substance to note is, that profits-tax payments are deductible for income tax, but income-tax payments are not deductible for profits tax.

A RECENTLY-COMPLETED high-vacuum furnace is now in use at the National Research Corporation Cambridge, Massachusetts. This furnace incorporates the accumulated experience of almost ten-year's work in the field of high-vacuum metallurgy. With a maximum capacity of ¼ ton, equivalent to several tons per day output, the furnace can be operated at pressures from the micron (10^{-3}mm. Hg.) range up to atmospheric. Its design is such that it can also be operated under partial pressures of various gases, such as argon, helium, nitrogen or hydrogen.

Visit to a Patternmaking Works*



Leicester City Coat of Arms, a casting pattern prepared by Perry's for a decorative plaque.

As part of a programme of visits to suppliers of foundry equipment, our representative recently had the privilege of visiting the works of G. Perry & Sons, who have at Leicester one of the largest master pattern-making establishments in Europe. For an independent concern, it is a sizeable undertaking; some 150 craftsmen are employed, the total floor space being of the order of 40,000 sq. ft., with over 100 machines in daily use. The company, founded in 1889, have two works in the city, one at Thornton Lane and a new one at Hall Lane. When the new shops were built it was thought to transfer the whole business, but rapid growth in recent years has been such as to keep both establishments fully occupied.

Layout

In the old works, which have more or less "grown up," the sectionalisation is more physical than methodical. There are a number of small shops with work benches arranged for the most part around the sides and nearest to the windows, with the machines which serve groups of patternmakers, in the centre. This is a system which has been found to work well for a shop with up to 25 craftsmen.* There are separate sections at the old works for very large wooden patterns (see Fig. 1) (crane facilities being available), for very intricate wooden pattern work (Fig. 2), for the cheaper types of wooden pattern and so on, but one feels that the operations have been, to some degree, arranged to suit the buildings rather than the opposite. Perhaps it would be more correct to say that patternmaking practice has made such progress that what originally was a shop well adapted to its purpose, is now not large enough to accommodate some of the newer machinery.

It is, therefore, at the new works at Hall Lane that the major interest lies, for here the layout has been sectionalised on a functional basis. The building is on a single storey, with the exception of the office and well-equipped canteen block at one end; a plan view is shown in Fig. 3 and a general view of the metal-pattern bay in Fig. 4. There are four main bays in the new works, with a total floor space of 24,000 sq. ft. Accom-

*This view is widely shared and was quoted in a Paper recently given to the South African branch of the Institute of British Foundrymen by S. Jane, printed in the JOURNAL on September 22, 1949.

FIG. 1.—LARGE PATTERN, 28 FT. LONG, FOR A CAST STEEL MILL-HOUSING WEIGHING 125 TONS.

Visit to a Patternmaking Works

modation is provided for the following sections:—(1) Very accurate mahogany patterns; (2) metal patterns and master patterns; (3) very large pine work; (4) medium-size and standard pine work; (5) foundry, where pressure-cast aluminium match plates are made, and (6) the finishing and checking room. Dust and shavings are exhausted from the individual machines and taken below the floor to a single large extraction unit. In the amenities section there are modern washrooms with hot-air hand driers and other refinements.

Machinery

On the wooden-pattern section, the classes of work are grouped. Each group of craftsmen has its own set of machines and works under a group foreman. The machines assigned to each group comprise, generally, a bandsaw, a circular-saw, a disc sander, planing machine, high-speed drill and a wood milling machine. There is no need, with the modern roof lighting, for the benches to be arranged round the walls; indeed, with the larger shop and more men employed, this arrangement is no longer feasible. Conversely, the work benches are arranged across the centre of the bays with the machines on either side. Thus a man has access on the one hand to his group machines and, on the other, to specialist machines.

Special Machines

The larger and more elaborate wood- or metal-working machines are not operated by the group craftsmen. Instead, each large machine is assigned to a skilled operator who takes instructions from the foreman of the group. In this category there are included a large wood lathe for accurately turning large-diameter patterns such as are used for jet-aircraft work, several universal pattern millers for wood and a band-type resawing machine to enable men to avoid waste from using over-thickness timber.

Metal-pattern Section

In the metal-pattern section, there are 15 metal milling machines, including a Cincinnati "Hydrotel," to take jobs up to 6 ft. 6 in. by 6 ft., an Adcock & Shipley No. 4 miller, six Wadkin "Universal" pattern milling machines (which can be used also for wood), a Brown & Sharpe No. 3 vertical miller, various smaller vertical and horizontal machines, centre and face-plate lathes and a metal-cutting bandsaw for non-ferrous sheet. In addition, this bay is equipped with compressed-air points for pneumatic hand tools and there are several electric flexible-drive portable machines. Patterns are made in an enormously-wide variety of shapes and sizes. Figs. 5 and 6 show machine operators at work on metal patterns; in Fig. 7 an apprentice is engaged on hand work.

FIG. 2.—MILLING A MAHOGANY GEAR PINION PATTERN.

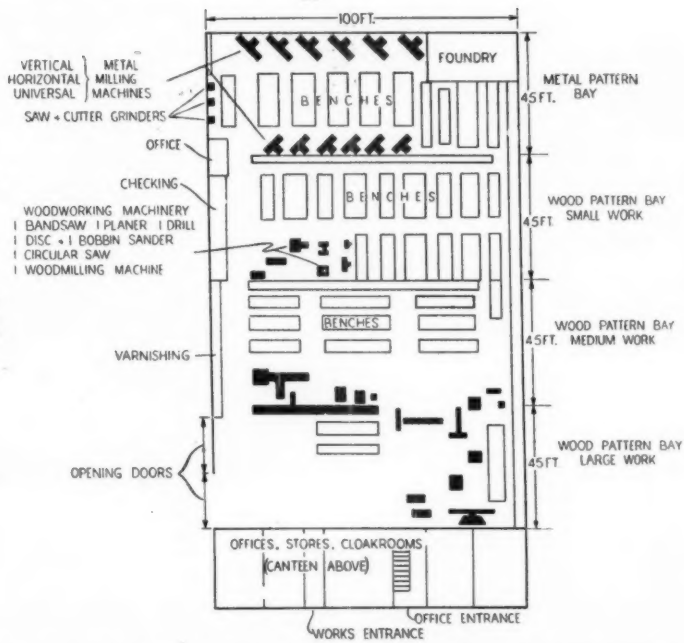


FIG. 3.—LAYOUT OF THE HALL LANE WORKS, SHOWING THE SECTIONAL GROUPING OF PRODUCTION AND MACHINERY.

Figs. 8 and 9 show further examples of metal-pattern work; the former is of a job mounted on a plate complete with runners and ingates and the latter the pattern equipment for an air-intake and a finished casting.

Job Organisation

The organisation of the job work is related to its size and intricacy. Usually, craftsmen are allocated to a job, one, two, three or more being employed according to requirements, and these men see the pattern through from start to finish. They use all the group machines and, on the wood side, do their own timber cutting, shaping and bench work and finally pass the pattern to the examination section. In this section, experienced checkers go over each dimension and finally the varnishers finish the pattern to the customer's requirements. As a sidelight, it is somewhat disquieting to note that the British Standard pattern colours are not widely adopted. In an area where there are a number of large foundries each seems to have its own ideas on colouring.

For metal patterns, the work is, of necessity, somewhat differently organised. The master patterns are made in wood, usually by one or two men, and much thought is given to layout and production requirements —pattern plates, joints, prints, cores, driers, etc.—as well as provision for machining in the pattern stage. Castings made in the alloy selected are then set-up and marked out by experienced metal-pattern layout men, or, in certain cases, by the original master-pattern maker. Machinery is then allocated by the foreman in charge, who also indicates what hand or bench work is required. Finally, when shaping is finished, the patterns are checked and then are often mounted on prepared plates, sometimes complete with runners and ingates. On occasions, where the shape of a pattern and corebox is difficult to arrive at, a sample casting is made off the pattern and this is sectioned and checked before the customer receives the finished job.

Office Organisation

A pattern, from this firm's point of view, usually begins with an inquiry to quote against a blue-print supplied. It is here that experience and knowledge, not only of patterns and patternmaking, but of the plant and equipment at the customer's works for making the casting is of supreme importance. Some firms have plant suited to moulding in one particular way, some like core boxes, others abhor them; some want interchangeability for machine plates; others want cheapness. This sort of information must be gleaned before a quotation is made and the method of producing the ultimate casting is decided upon; personal contact with the customer's methods is realised to be of the utmost value.

FIG. 4.—GENERAL VIEW OF THE METAL-PATTERN SECTION.

It is interesting to find that, at Perry's, engineers' drawings are preferred to casting or pattern drawings. Very often, on casting drawings, machining points or allowances are not shown. This omission frequently causes subsequent trouble with interference from tapers, jigging points, core-locations, etc. If a pattern-

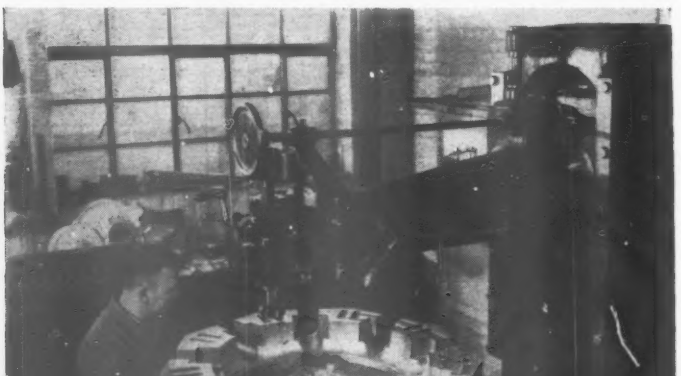


FIG. 5.—UNIVERSAL MILLER WORKING ON A LARGE ALUMINIUM PATTERN.

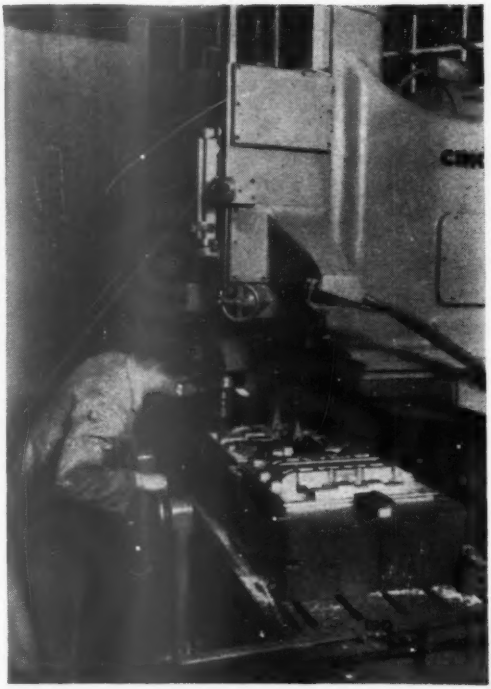


FIG. 6.—PREPARING A PATTERN FOR MOUNTING; THE MACHINE IS A LARGE VERTICAL MILLER.

maker knows the full history and final dimensions and shape, he can make equipment to suit. If, however, a casting drawing only is supplied, he is left in the dark as regards certain qualities which may turn out to be vital.

Another point, which seems to be well looked after at Perry's, relates to shop "progress." As the concern caters for the requirements of some 300 foundries, it will be realised that an inquiry from founder A, about his pattern *x*, must "ring a bell" somewhere and quickly produce a reply in terms of a delivery promise. For this purpose, the now familiar coloured alphabetical job cards on a visible board are used. At any moment, a job in progress, or waiting, or held-up, can be located and an answer supplied as to its position in the scheme.

Personnel

About 20 per cent. of the staff have more than 20 years' service with the firm. There is no dearth of apprentices; rather, the reverse operates—the number is limited to one for every four craftsmen. After a preliminary period to determine capabilities (spent on a

FIG. 7.—APPRENTICE AT WORK ON A METAL PATTERN.

number of jobs, including varnishing and finishing), an apprentice, for the majority of his five years' indentures, is put to work with a skilled man who is given every facility to give the younger man a full training on as wide as possible variety of work. Quite a high proportion of the intake of young men becomes really skilled.

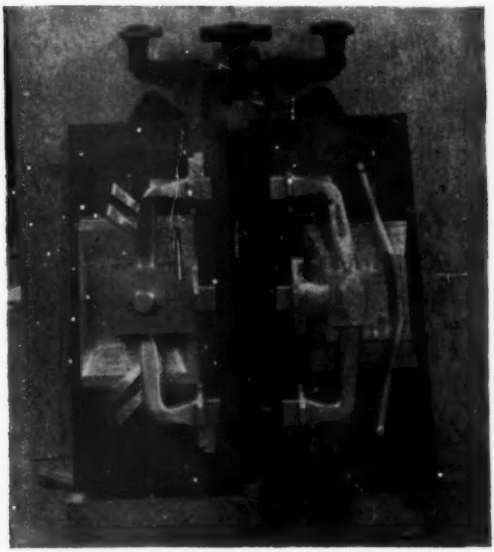


FIG. 8.—TYPICAL EQUIPMENT FOR A MOTOR-CAR INTAKE MANIFOLD CASTING.

Conclusion

An overall impression was confirmed by this visit that, while there is, and will be for a long time to come, a continued call for single "model"-type patterns, this work is reduced in volume. Instead, no doubt due to the falling-off of skill in foundries, there is an increased demand for "foolproof" pattern layouts, for shapes to be formed by cores, for quantity-production match-plates and for patterns to last for years and production runs in hundreds of thousands. These require more, not less, of the patternmaker's skill. Skill was much in evidence at Leicester and, certainly, the amenities of the new shop must give an added incentive to the craftsmen employed.

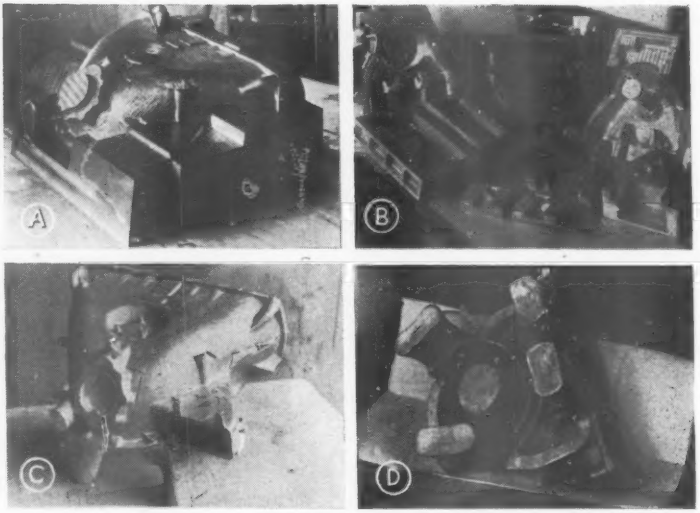


FIG. 9.—(A) PATTERN, AND (B) CORE BOXES OF AIR-INTAKE PATTERN EQUIPMENT. (C) AND (D) SHOW TWO VIEWS OF THE FINISHED CASTING.

Book Review

Gewaltzes Gusseisen (Rolled Cast Iron). A monograph of a new material for the engineer (in German). By E. Piwowarsky and A. Wittmoser. Published by Verlag W. Girardet, Essen. Price D.M. 9.30.

This book records the results of innumerable tests of the hot-working of cast iron, from which the Authors appear to have satisfied themselves that it can be successfully hot-rolled, pressed and forged. They give a lot of data, but in many cases pertinent facts have been omitted and it is impossible to appreciate exactly what was done.

One short section deals with the rolling of cast iron in a sheet mill. Thirteen different materials were experimented with, containing from 1.28 to 3.64 per cent. carbon. They say that the results of the investigation were satisfactory and give a table showing how one particular plate was reduced in thickness from 14 mm. to 4 mm. after five passes. They do not, however, give any other dimensions of the original raw material; neither do they state its analysis nor the rolling conditions.

The most striking success achieved by the Authors appears to be that of the rolling of rings. The metal contained 2.89 per cent. carbon, 1.4 silicon, 0.8 manganese, and 1.0 per cent. phosphorus, and the original cross-section was 7 by 20 mm. with an outer diameter of 145 mm. and an inner diameter of 105 mm. The original rings were cast in sand and then annealed for 17 hrs. at 875 deg. C. With a maximum rolling temperature of 950 deg. C., the Authors state that they were able to reduce the cross-section of the ring to 8 by 9 mm. and to increase the diameter to 180 mm. The rings, they say, were "practically free from cracks."

Not only the hot-working of cast iron previously cast into moulds, but also the rolling and pressing of cast iron from the liquid state is considered. It is stated that the tensile strength of various cast irons can, by the hot-working process, be increased from 25,000 to 40,000 lb. per sq. in. to 121,000 to 170,000 lb. per sq. in. with elongation between 3 and 10 per cent. The Authors believe that, if industry would devote some little time to a study of production problems, it should be possible to produce a wrought cast iron which would have excellent mechanical properties, particularly for engineering constructions where high mechanical strength and good damping capacity are required. It does not seem, however, that rolled cast iron will affect the iron-foundry.

In conclusion, the Authors say that their experiments have shown that the industrial production of hot-worked cast irons is a commercial possibility and they give a brief description of a works layout suitable for a monthly production of 500 tons. J. F. K.

The Worshipful Company of Founders*

Story of a Still-flourishing Mediæval Guild

Lothbury is said to have derived its name from the workshops there of the Founders who, according to the historian Stow, "cast candlesticks, chafing dishes, spice mortars, and such-like copper or laton works." Stow continues: "They do afterwards turn them with the foot, and not with the wheel, to make them smooth and bright with turning and scrating (as some do term it), making a loathsome noise to

the passers-by that have not been used to the like, and therefore by them disdainfully called Lothberie. Next is Founders' Hall, a proper house." Founders' Hall stands to-day in Founders' Court, Lothbury. This nineteenth-century building is now in the tenancy of Brown, Shipley & Company.

The first Hall on this site was completed in 1541. Almost from that time onwards the Founders' Company have followed the prudent policy of letting their premises and thus deriving from the rents an income which has helped them to avoid the disasters which other Companies have suffered from time to time. The Founders have another hall which includes their Court Room and offices. This, too, is mainly let to tenants. It occupies a site in St. Swithin's Lane, which the Company acquired in 1854 from the Salters' Company. Here stood two old cottages. To purchase this property, twelve members of the Court, at a Court meeting, put their subscriptions in cash on the table. This money was later paid off from the Company's income from rents.

Members' Loan

The present Hall in St. Swithin's Lane was erected in 1877. This project was made possible by means of a 4 per cent. loan from members of the Company. The loan has long since been paid off. This four-storied building has probably the longest continuous staircase baluster in the City. The original home of the Company in Lothbury is the only two-galleried Hall in the City. Here the early Merchant Adventurers of the City held their meetings. Over this Hall, in the reign of Charles I, presided a Master named Colonel Oglethorpe, who was Captain of the King's bodyguard, and remained true to his King. Eventually the gallant Colonel went off to establish the State of Georgia. In Founders' Hall some of the Dissenters held their first meetings.

In modern times there has been a natural tendency for university technical graduates to gravitate towards industries offering cleaner work and conditions. To correct this tendency, the Worshipful Company of Founders have spent, and continue to spend, money on awarding Fellowships to men who have already completed their normal course of training and who appear likely to be able to make good their careers in the founding industry.

Here it should be mentioned that this Company still represents its industry. It represents, indeed, a vital and virile industry. Most of the Company's recent members are actively concerned with foundries. This Company, to whom Ordinances were granted in 1365, was originally formed for the purpose of ensuring that work by founders in the City of London should only be with good metal.

The Company believes to-day that the development and progress of founding, and the science of metallury must depend very largely on attracting to the industry highly trained men of evident skill. The Company's contributions, in the form of technical scholarships and Fellowships, to Britain's industrial progress are extremely important and valuable. The course to be followed by any successful applicant for a Fellowship is chosen with the object of adding to his scientific equipment that which appears to be most necessary for adapting him to some branch of the founding industry. The course may include research, a period in works, or foreign experience.

Annual Toast

This vital educational work for industry has received a great and practical stimulus by the recent bequest of a trust fund under the will of Robert

* Reprinted from "The City Press" by courtesy of the Editor.

The Worshipful Company of Founders

Warner, a past master of the Company. Mr. Warner's will also made provision for a cup of hypocras to be drunk at the Court dinner of the Company on swearing-in day in October of each year from the silver cup he presented to the Company to mark his mastership.

This annual toast is to be in memory of his great-great-grandfather, Tomson Warner, who was master in 1786, and his grandfather, Robert Warner, who was master for the years 1862 and 1884.

A much earlier benefactor was Richard Weoley. He was master in 1631 and 1640. His memory is still honoured at each swearing-in Court. After the oath has been administered to the new master, the retiring master drinks the health of the new master in a cup of hypocras. The cup used on this occasion and at no other time was presented by Richard Weoley. It is a very beautiful Venetian painted glass goblet of fifteenth-century craftsmanship. It is probably unique. It was brought to England from France when Henry VIII had the town of Boulogne yielded to him, as "*parte of the pillage then taken of a Yeoman of the Crowne.*"

In his grant Richard Weoley expressed the desire:—"that this Glasse may be used in the Founders' Hall only upon the Election Day, when the Master and Wardens are to be Elected and chosen according to the ancient custom of this Company. The Old Master presenting to the New Master a Cupp of Hippocrass, drinking unto Him by the name of Master, which I desire may be in this Glasse. And I do hereby wish that my means were agreable to my Will, then should they record me a better Benefactor: And I shall ever wish the whole Body may ever live in Unity, Concord, and Brotherly Love, which is pleasing to God and Man. Even thus the God of Heaven Bless them all.—Amen."

The Company of Founders, whose craft is concerned with hard and durable metals, takes a very great pride in the fragile goblet of painted glass. During the recent war, when the Company dispersed its treasures to places of safety in Oxford and Pershore, they left the priceless Weoley Cup in London—so strong is their regard for tradition.

A special "dug-out" was cut into the concrete floor of the strong room in the Company's Hall in St. Swithin's Lane. Here the Weoley Cup remained safely throughout the war, although adjacent build-

A Bust of a Previous Master of the Company and an Old Bell in the Company's Hall. Two Examples of the Craftsmanship of the Past, which has survived through the Centuries to the Present, and which is still flourishing

Other Examples the Early Founders' Art. The large cast Weights used for "Sizing" date from 1684. In the Centre is an "Imperial" Measure of 1824, consisting of a "Nest" of Cups of Different Capacities. In the Foreground is a "Troy" Weight. This, too, is Cleverly Made so that the Separate Weights of Diminishing Sizes Fit into One Another to Make a Compact Whole

ings, including Salters' Hall, were demolished by enemy action. The "hypocras," "hippocrass," or "Yyocras," which has been drunk for so many years from the Weoley Cup, and is now to be drunk also from the Robert Warner Cup, is prepared from the following recipe:—

"Take a quart of Red Wyne, an unce of synamon and halfe an unce of gynger, a quartir of an unce of greynes, and halfe a pound of sugar, and brose all these, not too small, then putt them in a bage of wullen clothe made therefore with the Wyne; lete it hange ovir a vessell tyll ye wyne be rune thorow."

A historian of the Company has described the Founders as a small Company which "have never taken any prominent part in the passing turmoils or political struggles of the day. As a corporate body, it has unostentatiously endeavoured to perform its own prescribed duties, in relieving its poorer brethren, in settling disputes and punishing those dishonest members of the trade who were found acting contrary to its standing Ordinances."

For some 300 years the subject of weights and measures formed the most important of the Company's duties. This duty was closely allied with the Founders' general powers of search and supervision over their craft within the City of London and for three miles around. The Company's searchers in endeavouring always to maintain a high standard of craftsmanship, were particularly keen to detect the presence of lead or other foreign material in work claimed to be of brass only.

Rigorous action was taken against any who offended in this respect. Quite apart from considerations of personal pride, it was a fundamental point of principle that the public should not be deceived.

An entry in the Company's records, dated 1652, shows that one, Abell Hodges, had in his shop "one great stop cock, so thin that it would be of no service, and another stop cock filled with lead." Abell Hodges was summoned to the Court and was fined 20s. Other entries also show how conscientiously the Company carried out their duties. It is not surprising that such a responsible body of craftsmen were entrusted with the task of checking the City's weights and measures.

In 1884, the City of London Livery Companies' Commission reported:—

"The search and view of weights have long ceased, chiefly because the City searcher inspects, and if he finds a weight not Hall marked, directs, and if necessary compels it to be brought to Founders' Hall.

"The sizing and stamping of brass weights continues. About 20,000 weights on an average are sized and stamped at the Hall yearly. This is a principal part of the Beadle's duty, and there seems to be a preference in the trade for weights with the Hall mark."

Beadle's Right

Weights and measures are now governed by Acts of Parliament. The Board of Trade is the central authority. The practical administration rests with the local authority who employ inspectors. But the rights of the Founders' Company in this respect have never been abolished.

Even now the Beadle of the Company could undertake to check weights, but there is no record in the Company's Weights and Measures Receipt Book of this having been done since 1908.

In preserving the general welfare and reputation of the craft, the Founders had the power to compel those carrying out the calling of a Founder to join the Company. The system of apprenticeship was keenly supervised. In 1497 it was ordained that "every Brother taking an apprentice shall present him to the Wardens afore he be bounde, so that they may see and understande that he be free born and hole of lym."

Compulsory membership of all members of the craft and supreme powers over apprenticeship helped to make the Company's position an extremely strong and important one in the City. Therefore, any Founder desiring to be translated to another Company could do so only with the consent of the Founders' Company and on paying quite a substantial fine.

Watch and Ward

The Company held the right to enforce discipline by means of fines or dismissal. They legislated in disputes between members or their relatives, and between members and non-members. Supervision of the morals of members was another right exercised by the Founders' Company.

So far as civic responsibilities are concerned, the Founders' records show how these craftsmen in metals participated regularly in maintaining "watch and ward" in the City. They helped to purchase corn for national use. They contributed to the success of James I's Irish plantations project. Founders assisted in providing armed forces and munitions for service at home and abroad. And they took their allotted places at coronations and other public functions.

Avoiding the alternating extremes of great wealth and poverty, the members of this craft have always steadily maintained the City's traditions of hospitality and of good fellowship on festive occasions. The record of charitable bequests and gifts of plate to the Company is a long and interesting one.

Many years before they were able to finance technical scholarships and fellowships from the funds of their benefactors and to make contributions to the City and Guilds Institute, they were conducting a charitable fund for the relief of distressed and deserving Liverymen and of widows and orphans.

An inventory of 1682 discloses the existence and use in Founders' Hall of "Ye Poores Box." By his will of 1468, Henry Jordan bequeathed certain lands and tenements to provide an income for the purchase of 138 quarters of coal at 8d. per quarter. He willed that, among others, "the poor householders of the craft of Founders dwelling within the wall of the City of London" should have a quarter of coals each. Jordan, it should be added, made this

The Worshipful Company of Founders

bequest to the Fishmongers' Company who, ever since, have fulfilled his wishes, first in coal and later in cash in respect of the Founders' Company.

Grant of Arms

Although the Company, as a "mystery" received their Ordinances from the City in 1365, and were certainly in active existence for many years before this date, they did not obtain their Royal Charter until 1614, in the twelfth year of the reign of James I. Earlier, in 1590, the Founders had obtained a grant of arms.

The charter confirmed the Company's powers of supervision and search, and also the sizing and marking of brass weights. In common with other City Companies, the Founders were compelled to surrender their charter to James II. His restrictions, however, were repealed by a hasty Order in Council inspired by the news of the coming of the Prince of Orange in 1688.

later, the statute of William and Mary not only confirmed the reversal of James II's Quo Warranto, but enacted:

> "that all and every of the several Companies and Corporations of the said City shall henceforth stand and be incorporated as they respectively were at the time of the said judgement given. And that as well all surrenders, as Charters, Letters Patent, etc., touching or concerning any of their Liberties, shall be void to all intents and purposes."

This is the last confirmation of the rights and privileges of the citizens of London. In the national interests, particularly concerning the development of industry, many of the rights of the Founders and of other Companies have been voluntarily relinquished, but the spirit of the Guilds lives on.

Publication Received

Report of the Committee for Standardisation of Engineering Products. Published by His Majesty's Stationery Office, York House, Kingsway, London, W.C.2, and elsewhere. Price 9d. net.

The conclusions made in this Report were generally accepted by the average engineer long before the Committee was formed, and there is nothing worthwhile abstracting. For consumer goods, opposition to standardisation has been growing since they have been initiated by Government departments rather than industry. There are twenty recommendations, and the reviewer fails to find amongst them even one which is not in line with the normal trends of thought of those whose job it is to worry about standardisation. As a Report, it could usefully be left to "lie on the table."

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

CUPOLA CHARGE MATERIALS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Your issue of November 24 publishes a letter by Mr. W. W. Braidwood which mentions me by name fourteen times on one page.

As it is possible that the Report on cupola charge materials may be used by teachers of foundry students because it bears the name of our Institute, let us examine it from that angle alone. Let us accept Mr. Braidwood's own translation of the Report's recommendations on de-sulphurisation. He says, "*The guidance is that de-sulphurisation, where practicable, is desirable.*"

Unhesitatingly, I deny that. As an examiner I would fail the student who wrote that in an examination paper; as an employer I would reject the applicant who voiced that kind of doctrine.

De-sulphurisation puts up the cost of production. Anything which does that should be adopted only after concrete proof has been obtained by the foundry concerned that it is worthwhile on each of their particular products. In the ironfoundry I have just left, we de-sulphurised the metal for only two of the hundreds of types of castings we produced. We did that because a six-months' observed trial gave figures justifying it. With the other castings, it proved unjustifiable either in the foundry, the dressing shop, the machine shops, or the test-beds. Precisely the same reasoning and procedure should be applied to inoculation.

That I have made cast iron and "semi-steel" all my life without employing, as a rule, any of the costly precautions here recommended as desirable, is of as much interest and value to foundrymen as the advice of this Report.

While the views of those in favour of the Report may be all that is constructive and substantiated, and while those against may be destructive and unsubstantiated—I employ Mr. Braidwood's own descriptions of my views—the fact remains that the accepted impersonality of one's considered opinion is a prerogative of the scientist when he is criticising anything put up for discussion at a scientific meeting, and this great Institution of ours, no less than other scientific bodies, sheds that protection even upon.—Yours, etc.,

HORACE J. YOUNG.

109, Highlands Boulevard, Leigh-on-Sea, Essex.
December 1, 1949.

MR. ROBERT STRACHAN has retired from the board of the Fairfield Shipbuilding & Engineering Company, Limited, Glasgow, having completed 60 years' continuous service with the company. He commenced his apprenticeship in January, 1890, and after occupying successively the posts of chief engine draughtsman and engineering manager, was elected to the board of the company in 1928. In 1937 he was appointed joint managing director, from which position he retired nine years later, but retained his seat on the board.

Guide to Aluminium Founding V

Moulding and Core Sands for Aluminium Castings

By A. W. Brace, A.I.M.

(*Concluded from page* 659.)

Sands used in moulds for aluminium-alloy castings are similar to those used for other non-ferrous metals. They are usually naturally-bonded sands, although synthetic sand is encountered, especially in core-sand mixes. The main advantage of aluminium casting in relation to sand costs is that the lower casting temperatures permit of the sand being re-used. A small addition of new sand is made to make up for normal losses, but there is no need to discard burnt sand.

The main requirements for a suitable moulding sand are that it should be of uniform grain size to give a smooth finish, and it should have satisfactory permeability and a low clay content. Aluminium alloys are very sensitive to the sand surface, and the degree of surface finish on the castings depends upon fineness of the sand. The permeability figure, which is a measure of the ease with which gas will escape from the mould, should be 30-40, by the standard test. Among the sands which come into this category are Bromsgrove, Kidderminster and Belfast red, and Erith loam. The permeability of these sands varies and occasionally small proportions of a sand with higher permeability need to be added in order to bring up the value. Typical permeability values for various sands are:—

	Moisture per cent.	Green permeability number.
Mansfield red	6.0	24
Bromsgrove red	6.0	38
Erith (yellow loam)	5.0	40
Kidderminster	7.0	32
Belfast red	6.5	35

Since the casting of aluminium in a green-sand mould generates a large volume of steam, the permeability number is of importance. An inadequate value will result in blown castings, and mean values of 30 to 40 should be aimed for. Naturally, the permeability value decreases as the moisture content increases, and it follows that this constituent should be kept within 5 and 7 per cent. If the top limit is exceeded, there is an additional danger of the metal reacting with the water vapour to produce a very porous surface to the casting.

Sand Treatment

Owing to the low casting temperature of aluminium alloys, the sand retains its bond for a long period. The usual practice in many foundries is to use new sand facing the pattern and back up with floor sand. An addition on these lines will compensate for any deterioration of properties. Mixing and sieving of the sand, rather than milling, is the only treatment the sand requires apart from water additions. After moulds have been knocked out, sufficient water should be added to the sand to restore the moisture content to normal, and then it should be processed through a sand-conditioning machine similar to that shown in Fig. 1, which removes core wires and small lumps of sand and aerates the sand, restoring it to a uniform workable condition.

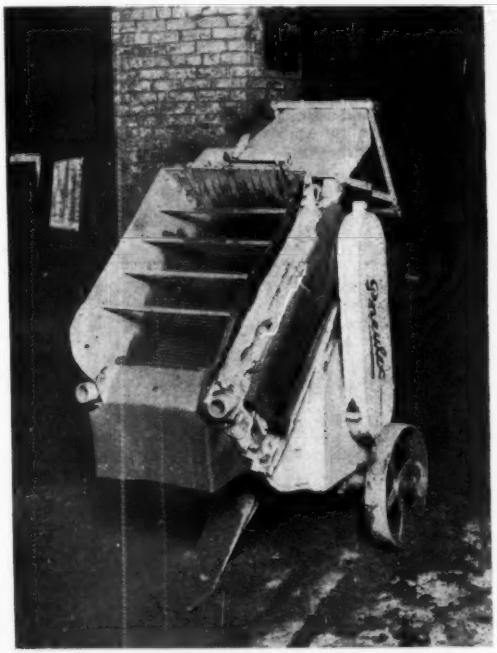


FIG. 1.—PORTABLE SAND-CONDITIONING MACHINE FOR USE ON THE FOUNDRY FLOOR.

Guide to Aluminium Founding V

Because molten aluminium is very sensitive to the quality of the moulding-sand surface, it is desirable to use a fine facing sand. However, since permeability tends to decrease with increase in fineness, a mould wash is often employed where appearance is of major importance. A mixture of this type consists of[1]:—Best white talc, two parts; whitening, one part, and molasses, one part. This is made into a cream with water and sprayed or brushed on. Mixtures of talc and bentonite in water are also popular in some quarters. It is said that bentonite or Fulbond gives better adhesion than a bond of molasses, which is of a more temporary nature. Another facing agent occasionally used is graphite. Since these mixtures are bonded with water, they have to be dried with a gas torch. By using similar substances suspended in a volatile solvent, air-drying mixtures have been developed. Methods of applying mould dressings vary. Most moulds are finished either by spraying or brushing; when cores are so treated, they may be dipped where sizes permit. The consistency of these mixtures should be adjusted according to the method of application. Table I, mainly based on work by Sheehan and Hudson, indicates suitable consistencies. It is important that this factor be correctly established, otherwise the coating will be too thin to be effective, or so thick as to affect the dimensional accuracy of the casting.

TABLE I.—*Recommended Consistencies for Mould and Core Dressings*

Method of application.	Thickness of wash mixture.	
	Viscosity.	Specific gravity.
By spray or swabbing..	46	1.21 to 1.24 or 25 to 28 deg. Be
By brush application ..	48	1.26 to 1.28 or 30 to 32 deg. Be
By dipping	54	1.35 to 1.38 or 38 to 40 deg. Be

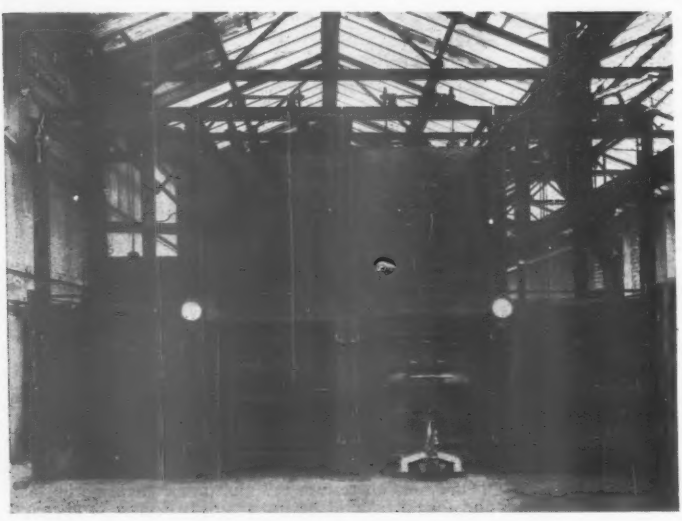


FIG. 2.—BATTERY OF FOUR BATCH-TYPE CORE-DRYING OVENS, FITTED WITH LIFT-UP, COUNTERBALANCED DRAWERS.

Dry-sand Moulds

Dry-sand moulds are used for some types of automobile and aircraft work, particularly where fins, such as those on cylinder heads, have to be produced and a high degree dimensional accuracy is of major importance. This technique usually ensures greater freedom from inclusions, dross and surface porosity. The absence of moisture may sometimes assist running and feeding, since the over-all properties of the sand are more uniform and no local chilling effects from small patches with high moisture content are encountered. Another practice for certain classes of work is to use a core-sand mixture for the mould. This is helpful where intricate patterns are used. The higher cost of the sand must be considered against the greater accuracy and lower rejects produced by this means.

Cores

Cores for aluminium castings may be made in a variety of sands. For simple cores, where a good location is available and erosion by the metal stream is not marked, ordinary floor sand can be used. More usually, cores are made in a silica sand bonded with oil and dextrin. Table II[2] gives recommended practice for American foundries which is rather similar to British methods with regard to core-making. Mixtures such as those listed give reasonable green-strength combined with a high dry-strength and dimensional accuracy. It should be remembered that cores for aluminium castings do not require values as great as those for cast iron. If the strength is too high and the core will not yield during contraction of the metal, then hot-tearing will occur. It is preferable to keep to a minimum the number of core-sand mixtures used in any shop. Much will depend, of course, on the range of work normally undertaken. A large solid core will require high permeability, but a long, thin core will need to have high strength. Cores of complicated shape will need a good green-strength so that they will not be distorted in handling.

Drying of Cores

The temperature at which the cores are dried has an appreciable effect on their properties. In general, it can be said that the best drying temperature is around

170 deg. C. (340 deg. F.).[3] Increasing the temperature to 200 deg. C., may result in the strength being lowered to as little as 25 per cent. of its normal value. If the baking temperature is too low, then the bond will not be properly developed, and, more serious, the cores will give off large volumes of gas during casting which will result in dirty, porous castings.

The type of stove used will depend upon the requirements of the individual foundry. For the average jobbing foundry one of the batch type with horizontal drawers of varying size is suitable. Larger types are usually divided into segments with loading racks which can be withdrawn (Fig. 2). For shops undertaking large-scale repetition work a continuous stove is employed. The oven should always be fitted with one or more thermometers and operated at a set temperature. Consistent results can only be achieved by this means.

Core boxes may be made of wood or metal. Those where the number of castings involved justifies the expense of making the equipment of metal are best made in aluminium, which has the advantage of combining lightness with ease of machining. Only where large quantities are required can core-blowing be considered. The core boxes should then be made of cast iron, because of its wear resistance for this type of work.

General Conclusion

It can be seen from these articles that the production of aluminium-alloy castings presents no particular difficulties. An appreciation of the fundamental chemistry and physics of the metal is useful; once its characteristics are recognised and understood, it presents few problems. The accuracy which can be attained is high and the surface finish is good. The attractive properties of aluminium alloys are being widely recognised and there seems every reason to expect a steadily growing demand for castings.

REFERENCES.

1 "Foundry Practice," A. Tipper. Odhams Press, p. 223.
2 "Recommended Practices for the Sand Casting of Non-Ferrous Alloys," p. 105. American Foundrymen's Society.
3 "Aluminium-alloy Castings," p. 142. E. Carrington, Chas Griffin & Co.

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"Sandslinger Moulding Practice," Buchanan. Proc. Inst. of Brit. Foundrymen. Paper 795, June, 1944.
"Production of Aluminium-alloy Sand Castings." Light Metals, 1939, 2, 361.

TABLE II.—*Typical Core-sand Mixtures for Aluminium-alloy Castings.*

Sands.	Binders.	Compression strength (green), lb. per sq. in.	Compression strength (baked), lb. per sq. in.	Permeability number.	Uses.
800 lb. washed silica sand 200 lb. back sand	8lb. cereal flour (for green bond) 2-5 qts. core oil 20 qts. water 2 qts. paraffin	0.6 to 0.8	300 to 700	70 to 110	A general-purpose mix for large and small cores requiring smooth surface, moderate green-strength, and high permeability. Oil content is varied to obtain the required dry strength.
925 lb. back sand .. 75 lb. moulding sand	3 lb. cereal flour .. 9 lb. dextrin base 7 qts. core oil 35 qts. water	1.4 to 1.7	350 to 450	50 to 70	For large and small cores requiring very smooth surface and high green-strength. Permeability is moderate.
1,000 lb. washed silica sand 28 lb. fines	7 qts. core oil .. No water	0.2 to 0.25	550 to 560	70 to 90	Special-purpose facing sand for intricate cores. Usually requires wire reinforcements because of low green-strength.
1,000 lb. washed silica sand 40 lb. fines	8 lb. cereal flour .. 7 qts. core oil 15 qts. water 2 qts. paraffin	0.6 to 0.8	400 to 500	60 to 90	A core-blowing mix where high flowability and moderate green-strength must be combined.
1,000 lb. burnt core sand ..	9 qts. dextrin base 3 qts. core oil 20 qts. water	0.8 to 1.2	400 to 500	60 to 100	An inexpensive mix for backing sand or for side cores with metal in contact with one side only.

THE HEAD OFFICE of the British Oxygen Company, Limited, is now at Bridgewater House, Cleveland Row, St. James's, London, S.W.1 (telephone Whitehall 9777).

THE ADOPTION of the metric system of weights and measures as the only standard system used throughout India has recently been recommended by a special committee of the Indian Standards Institution. The transition period should be spread over 10 to 15 years. The committee has also suggested the introduction of the decimal currency system.

THE NORTH BRITISH STEEL FOUNDRY, LIMITED, of Bathgate, Scotland, has just completed a new dressing shop, designed to give the best possible working conditions. A Hydro-blast plant has been installed, and castings passing through it are thereafter heat-treated, shot-blasted and, if necessary, fettled in a chamber which is exhausted. The swing-frame grinders are also exhausted (through the frame of the machine). Similar measures are taken throughout the shop.

Pattern Stores

By "Checker"

The storing of patterns does not always get the consideration it deserves, which is unfortunate, in view of the considerable amount of time and money that can be expended in searching for lost patterns and core boxes and in repairs rendered necessary by bad storing of pattern equipment.

These time and money wasters can be largely eliminated in a well-organised pattern stores, the layout of which is consistent with the firm's particular type of work, and the shape of the building. Breakages during storage can be reduced by having good racks and shelves, or bins, with sufficient space allocated to reduce the possibility of patterns being in heaps, with the resultant upheaval every time any from that particular shelf or bin are required.

TABLE I.—*Pattern Store Record Card.*

Pattern No.	Title.	Rack.	Shelf.
A 1234	*Bracket*	*2*	*C 3*
Pattern.	Core boxes.	Loose pieces.	
Wood	*3. Wood*	*Pattern 2.*	*C/box 4.*

Date received.	From.	Remarks.	Date sent out.	To.	Remarks.
30/4/48	*Fdy.*		*11/8/48*	*Fdy.*	
7/10/48	*Fdy.*		*8/3/49*	*Patt.*	*Alteration*
18/5/49	*Fdy.*				

Space is an important factor and provision of the necessary amount sometimes gives concern to those responsible. Very often, much pattern equipment is held in stock, taking up precious space, when it could be scrapped. This scrapping of equipment should be carried out only when permission has been obtained from some high authority such as the designer or works manager. Co-operation in this matter should be forthcoming if the foreman pattern-maker submits a list of pattern equipment which he considers to be obsolete.

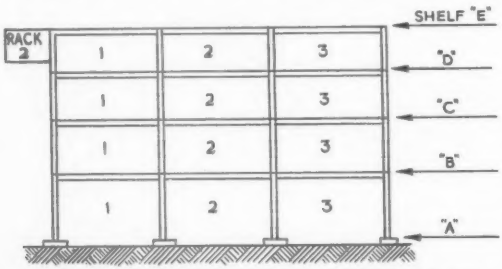

FIG. 1.—SUITABLE MARKING METHOD FOR THE RAPID IDENTIFICATION OF RACKS.

Time spent in finding patterns and core boxes which are to be withdrawn from the stores can be kept to a minimum if a card-index system is used. The cards should be printed so that all necessary information can be quickly entered and seen at a glance. The particulars suggested are:—Present location; whether at patternshop, foundry, or pattern stores; date when last sent out or received; amount of equipment, number of core boxes, loose pieces, etc., and exact position in stores. Table I illustrates such a pattern record card.

Patterns mounted on boards or plates for machine moulding should be kept together in special plate racks, while larger plates, which cannot be accommodated in this manner, could be stored on their edge in bins along the walls. Gangways running the full length of pattern stores and between the racks should be of a generous width to allow easy access in and out when moving pattern equipment. All racks and shelves should be lettered or numbered plainly. The diagram, Fig. 1, shows a suitable way of marking racks for rapid identification.

Joint Engineering Conference, 1951

The Institutions of Civil, Mechanical, and Electrical Engineers have decided to hold, in London, a Joint Engineering Conference from June 4 to June 15, 1951, to coincide with the Festival of Britain.

The theme of the conference will be to place on record the achievements of British engineers, and will afford an opportunity for the engineers of the world to discuss the future trends of developing the great sources of power in nature for the use and convenience of man. The conference will also emphasise the interdependence of all branches of engineering, for none of the great developments in the last 100 years would have been possible without the constant and ever-growing co-operation of the members of the three major engineering institutions in Great Britain.

Mindful of the importance of maintaining the high standard and technical efficiency of British engineers in the future, the conference will also discuss the development of the system of education of engineers in this country. The detailed arrangements are now being prepared and will be published shortly.

Data Sheets

The recent publication of the British Standard 1490, Aluminium and Aluminium-alloy Ingots and Castings for General Engineering Purposes, has made it necessary to revise the data sheets issued by Alar, Limited, in certain small details in order to bring them into conformity with the new standard. An amended summary data sheet, in which the chemical composition and mechanical properties are identical with those of BS.1490, is now available, together with the revised individual data sheets, on writing to Mr. F. H. Smith, the development officer for Alar, at 3, Albemarle Street, London, W.1.

Personal

MR. T. L. REID, the Australian manager of James Howden & Company, Limited, is in this country for consultation.

MR. E. N. HICKMAN and MR. G. F. ANDERSON have been appointed to the board of the Anglo Metal Company, Limited.

MISS RUSSELL, a member of the advertising staff of the FOUNDRY TRADE JOURNAL, was married recently at Chesterfield to Mr. Barritt.

MR. ROBERT HYDE is to relinquish his post as director of the Industrial Welfare Society; he will be succeeded by MR. JOHN MARSH, deputy director.

MR. JEAN LAINE, whose friendly qualities have been so much appreciated by British foundrymen when in Paris, has been created a *Chevalier de la Légion d'honneur*.

MR. A. R. MORRIS, of Carrier Air Conditioning, Limited, Sydney, Australia, is visiting this country. His address is c/o the Carrier Engineering Company, Limited, 24, Buckingham Gate, London, S.W.1.

MR. R. B. CHARLTON, managing director of R. Blackett Charlton & Company, Limited, non-ferrous founders, etc., of Newcastle-upon-Tyne, has been elected chairman of the Northern branch of the National Union of Manufacturers.

MR. F. H. PLAISTOWE has resigned his directorship of Baker Perkins, Limited, manufacturing engineers, etc., of Peterborough. At the end of July, he returned from a 20,000-mile tour of South America which he undertook as the company's sales director.

MR. J. W. HARGREAVES, general manager of Babcock & Wilcox, Limited, boilermakers, etc., of Renfrew, is to retire at the end of the month. He will, however, retain his connection with the company. Mr. Hargreaves has been associated with the firm for 36 years.

MR. W. K. G. ALLEN, joint managing director of W. H. Allen Sons & Company, Limited, Bedford, and MR. A. H. CHILTON, a director of J. Stone & Company, Limited, Deptford, London, S.E.14, have been elected to the council of the British Engineers' Association.

MR. R. A. MILLER, assistant managing director of Motherwell Bridge & Engineering Company, Limited, has returned after completing a 3-month tour of India and the Middle East. His firm is claimed to be the largest exporter of prefabricated oil tanks and pressure vessels to these areas.

MR. H. S. LEWIS, London manager of Richardsons, Westgarth & Company, Limited, marine and turbine engineers, etc., is retiring at the end of the year after 22 years' service with the company. He is being succeeded by MR. E. A. EBORALL, who joined the company as assistant London manager last June.

MR. F. R. WISKAR, steel-plant manager at the Britannia works of Dorman, Long & Company, Limited, Middlesbrough, has been transferred to a similar post at the company's Cleveland works. On leaving the Britannia works he was entertained at a complimentary dinner at which he received a presentation from the employees and management.

SIR ERNEST OPPENHEIMER, chairman of the Anglo-American Corporation of South Africa, Rhokana Corporation, and other companies, and Mr. Robert C. Stanley, chairman of the International Nickel Company of Canada, have joined LORD MCGOWAN and Mr. A. Chester Beatty as honorary presidents of the Copper Development Association.

MR. E. POTTS, who for very many years has been foundry manager for the Westinghouse Brake & Signal Company, Limited, of Chippenham, is retiring at the end of this year. The family connection, however, is being retained, as his son, Mr. Donald H. Potts, has been appointed works engineer—foundry and allied departments. Mr. F. Hodgson, who for several years has been foreman, is promoted to foundry superintendent.

Obituary

MR. GEORGE PARE, director of Barnard & Sons, Limited, Barking, Essex, died on December 6.

MR. ABRAHAM LUMB, who died on December 8, was chairman of James Lumb & Sons, Limited, engineers, of Elland, Yorks. He was 73.

MR. LEON WALTER LAW, late of W. H. Allen Sons & Company, Limited, mechanical and electrical engineers, of Bedford, died on December 9 at Heidelberg.

MR. ALEXANDER MACKAY, who retired two years ago from the secretaryship of the Royal Technical College, Glasgow, has died at the age of 67. He was connected with the College for 43 years.

MR. VERNON HOPE, who died suddenly on December 6 at the age of 72, was chairman and managing director of Parmiter, Hope & Sugden, Limited, manufacturing electrical engineers, of Manchester.

MR. HARRY THORNE, who died recently, at the age of 71, was chairman of Dawnays, Limited, structural engineers, of Battersea, London, S.W.11, and Henry Pels & Company, Limited, manufacturers of presses, guillotines, etc., of Osnaburgh Street, London, N.W.1.

MR. H. G. WISE, who died on December 7 following a short illness, had been a member of the staff of the Power-Gas Corporation, Limited, and Ashmore, Benson, Pease & Company, Limited, Stockton-on-Tees, for the past 10 years, and had been connected with the gas industry for most of his career.

Wills

BANKS, JOHN, a director of the Darlington Railway Plant & Foundry Company, Limited; for some years a director of George Denham & Company, Limited, engineers and ironfounders, of Darlington, and formerly works manager and a director of the Darlington Forge, Limited (taken over in 1932 by the English Steel Corporation, Limited) £38,651

DENHAM, HARRY, chairman and managing director of Denham's Engineering Company, Limited, Halifax, and a director of the Scottish Machine Tool Corporation, Limited, Glasgow, a member and past-president of the Halifax District Engineering Employers' Association £27,518

WRIGHTSON, W. I., formerly a director of Head, Wrightson & Company, Limited, engineers, ironfounders, etc., of Thornaby-on-Tees £29,483

Steel Target Upper Limit in Sight

Last Month's Output Rate was a November Record

Although there will inevitably be some recession in steel output over the Christmas holidays, the industry believes that it will achieve the upper limit of the production target of 15¼ to 15½ million tons set by the Government for the year in the "Economic Survey." Output last month was at the highest rate ever achieved in the month of November.

Production of steel ingots and castings in November was at an annual rate of 16,358,000 tons, compared with a rate of 15,959,000 tons in the previous month and with 15,760,000 tons in November, 1948, which was the previous best November output. Last month's output was only slightly below the best month the industry has ever had; this was last May, when the production rate was 16,409,000 tons.

In announcing the latest returns, the British Iron and Steel Federation states that the high rate of production now being achieved compares favourably with the best pre-war, or wartime, month—the month of May, 1940—when the rate was 14,314,000 tons. Production was running at a rate of 15,449,000 tons a year during the first three-quarters of this year, and the Federation believes that, with higher figures for October and November, and still allowing for some fall at Christmas, the industry should overhaul the upper limit of the Government's production target.

Pig-iron production in November was at an annual rate of 9,745,000 tons, against 9,565,000 tons in October and 9,636,000 tons in November of last year.

Latest steel and pig-iron output figures (in tons) compare as follow with earlier returns:—

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1949—1st quarter ..	179,300	9,324,000	304,800	15,850,000
2nd quarter ..	183,800	9,559,000	306,600	15,944,000
3rd quarter ..	181,700	9,448,000	279,900	14,552,000
First 9 months	181,600	9,444,000	297,100	15,449,000
October ..	183,900	9,565,000	306,900	15,959,000
November ..	187,400	9,745,000	314,600	16,358,000
1948—1st quarter ..	174,700	9,084,000	287,200	14,933,000
2nd quarter ..	182,000	9,464,000	294,700	15,325,000
3rd quarter ..	175,800	9,143,000	269,200	13,998,000
First 9 months	177,500	9,230,000	283,700	14,752,000
October ..	183,200	9,525,000	297,200	15,455,000
November ..	185,300	9,636,000	303,100	15,760,000

THE DATE of the next meeting of the Sheffield Branch of the Institute of British Foundrymen has been altered from January 2 to January 11, when a discussion will take place on "Productivity," to be opened by the Steel Founding Productivity Team which recently toured America. This meeting will be held in the canteen of Samuel Osborn & Company, Limited, Mushet Works, Penistone Road, Sheffield, and will begin at the usual time of 7.30 p.m.

Company Results

(Figures for previous year in brackets.)

BUTTERLEY COMPANY—Interim dividend of 3½% (same).

J. H. SANKEY & SON (HOLDINGS)—Interim dividend of 7½%. The company was made public in October, 1948.

JOHN FOWLER & COMPANY (LEEDS)—Dividend of 10% for the year ended September 30 (nil for the previous nine months).

ZINC INVESTMENTS—Income for the year ended June 30, £12,385 (£12,387); balance, after tax, etc., £11,269 (£11,336); to dividends totalling 4½% (same), £11,250 (same); forward, £1,022 (£1,003).

WOMBWELL FOUNDRY & ENGINEERING COMPANY—Net profit for the year ended July 31, after taxation, etc., £7,394 (£5,904); final dividend of 11½%, making 17½% (same); forward, £9,474 (£8,405).

WEARDALE LEAD COMPANY—Sales for the year ended September 30, £73,309 (£56,739); balance after depreciation, tax, etc., £5,414 (£4,468); final dividend of 6%, making 10% (same); forward, £7,426 (£4,705).

SAMUEL FOX & COMPANY—Trading profit, including miscellaneous income, to June 30, £436,042 (£533,621); net profit, after depreciation, income tax accrued, etc., £275,756 (£361,912); to tax arising on additional 1947 profits, nil (£11,959); maintenance provision, nil (£12,385); to ordinary dividend, £273,116 (£359,272).

JOHN HOLROYD & COMPANY—Group trading profit to September 30, £405,509 (£402,276); profit, after depreciation, tax, etc., £90,264 (£106,935, plus £51,000 from contingencies reserve); to general reserve, nil (£141,000); stocks reserve, nil (£25,000); staff pensions reserve, £50,000 (nil); dividend of 20% (same); forward, £111,361 (£87,597).

ALLIED IRONFOUNDERS (IRELAND)—Profit for the year to June 30, £9,704 (£3,151); preference dividend for the year to date, £1,470 net (£2,730 net for two years); income tax, £4,500 (£1,137); ordinary dividend of 2½% (nil); reserve for reduction of preliminary expenses and deferred revenue accounts, £2,000 (£1,000); forward, £3,083.

UNIVERSAL GRINDING WHEEL COMPANY—Trading profit from September 25, 1948, to October 1, 1949, £449,298 (September 28, 1947, to September 25, 1948, £469,964); net profit, after depreciation, tax, etc., £170,073 (£186,618); plus £75,000 (nil) surplus tax provisions for previous periods; dividend of 10% tax free (same); to general reserve, £190,954 (£125,000); forward, £72,646 (£68,427).

ROUND OAK STEEL WORKS—Trading profit for the year ended June 30, £321,262 (£258,821); other income, £1,876 (£7,452); to depreciation, £27,145 (£28,257); loan interest, £511 (nil); debenture interest, nil (£13,874); staff pension scheme, £4,000 (same); audit fee, £525 (£368); directors' remuneration, £13,828 (£16,895); tax, £159,000 (£98,000); profit, £118,129 (£123,552, including £18,423 recoverable in respect of claim for expenditure on deferred repairs executed before June 30, 1947); to interest on loan from Finance Corporation for Industry, £10,939 (nil); plant modernisation scheme, £5,049 (nil); dividend of 8% (same); forward, £223,198 (£152,308, after deducting £21,000 provision for tax in respect of previous years, £10,682 stamp duty and professional fees on capital increase and debenture issue, and £4,340 premium on redemption of debenture stock).

BIRMID INDUSTRIES—Group trading profit to July 31, £979,917 (£1,038,599); dividends and interest, £1,427 (£2,108); profit on sale investment in subsidiary, £3,250 (nil); to depreciation, £325,841 (£304,422); auditors' remuneration, £1,980 (£2,016); income tax, £259,775 (£299,198); profits tax, £114,065 (£133,450); profit, £282,933 (£301,621); surplus taxation in previous periods, £103,990 (£157,152); dividends and interest in previous periods, £675 (£2,938); to special depreciation and obsolescence reserve, nil (£10,000); proportion of profits in subsidiaries attributable to shares outside group, £5,222 (£6,072); retained by subsidiaries, £239,538 (£311,009); leaving parent company, £142,838 (£134,630); to general reserve, £25,000 (same); dividend of 10% and bonus of 10% (same); forward, £75,575 (£63,227). Last year's accounts covered the parent company for nine months and the subsidiaries for 12 months.

STANTON-DALE

REFINED PIG IRON

Designed to meet the demands of high quality castings, which are, strength, machineability, and resistance to wear.

All these can be secured by using Stanton-Dale Refined Pig Iron in your cupolas.

The above illustration shows a group of castings made by Messrs. Goodbrand & Co. Ltd., Stalybridge, Cheshire.

PROMPT DELIVERY

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Raw Material Markets

Iron and Steel

The expansion of pig-iron production seems to have restored the balance between supply and demand. No longer hampered by shortages, foundrymen are achieving good outputs of castings; although orders for 1950 are not coming to hand so freely, makers of heavy engineering and special castings still have a substantial volume of work in hand. Pressure for deliveries of high-phosphorus iron is not nearly so keen, but there is no substantial surplus and the authorities continue to refuse all applications for export licences except in the case of refined iron. Consumers are taking up good supplies of hematite and low- and medium-phosphorus grades are more freely available.

The heavy imports of steel semis from Western Europe during the third quarter have not yet been fully absorbed, chiefly because of the shrinkage in the demand for re-rolled material. Consequently, there is less interest in the larger sizes of billets, blooms, etc. On the other hand, outputs of small billets, sheet bars, and slabs are fully absorbed, and it is hoped that business in other classes of home-produced semis will revive after the turn of the year.

Distribution of finished steel products to home consumers is now on a more liberal scale. Stocks are substantial and there is promise of increased allocations for the first quarter of 1950, although export orders will no doubt be given high priority. New orders for sectional material are inclined to lag, but the pressure on plate-mill capacity is intense and sheet mills are assisting in the rolling of medium sizes. Rollers of light sheets have such extensive commitments that it is difficult to secure acceptance of any more business. The wire drawers are similarly placed. A steady flow of orders is reaching the rail mills, and rollers of colliery equipment are also well employed.

Non-ferrous Metals

The November copper statistics published in New York by the Copper Institute have confirmed the optimistic views that have been taken of the situation in that metal during the past few weeks. If demand for copper on this side of the Atlantic were as good as it is in America, the price would probably have risen to 20 cents per lb. by now. As it is, the U.S. November figures have certainly stirred some enthusiasm in those quarters where an advance beyond 18¼ cents has been expected since the early days of this month.

Production of crude copper during the month was 80,778 short tons, against 69,061 tons in October, and of refined metal 92,688 tons, compared with 86,882 tons. Stocks of refined copper fell from 164,464 short tons at the end of October to 139,285 tons at November 30, while deliveries to domestic consumers advanced from 108,192 tons to 118,146 tons. Certainly an impressive figure. The healthy state of the statistical side of copper, coupled with persistent buying by users, who are endeavouring to cover their January requirements, is undoubtedly responsible for the bullish sentiment which prevails. Copper scrap has advanced again and is now at 15¼ cents, the level at which it stood before the recent reduction.

The opinion is expressed in many quarters that there can be no real satisfaction in the tin position until the market carries a contango on the future quotation. It is believed that before very long supplies of tin will be coming forward independently of the Government metal; this should have the effect of putting the market into better balance and, in due course, eliminating the backwardation. Then the opportunity will arise to hedge against holdings of tin and the market will begin to assume something like a normal appearance.

Metal Exchange tin quotations were as follow:—

Cash—Thursday, £608 to £610; Friday, £604 to £605; Monday, £604 to £605; Tuesday, £604 to £605.

Three Months—Thursday, £580 to £581; Friday, £572 to £572 10s.; Monday, £572 to £572 10s.; Tuesday, £573 to £573 10s.

Nodular Cast Iron

In an article by Mr. C. R. Austin, printed in the December 1 issue of the "Iron Age," some engineering aspects of Meehanite nodular irons are detailed. Extensive data on microstructures and physical properties, and results of dynamometer tests of nodular iron brake drums are given. The tensile-strength range is between 30 and 50 tons per sq. in. After heat-treatment, a lowered tensile is to be associated with 10 per cent. elongation.

Many nodular-iron castings have been manufactured, including such items as the following:—(1) Lifting clamps for handling heavy ingot moulds, pump rocker-arms and hangers, for applications requiring high strength; (2) brake shoes, Wheelabrator hooks and shake-out hammers, where toughness or resistance to failure under impact stresses is a criterion of serviceability; (3) brake drums, firegrates, permanent moulds and pig beds, where resistance to high temperature or thermal shock is a determining factor; and (4) Wheelabrator cones, injector nozzles for liquid metal, and beater points for sand plants, where resistance to abrasion is a factor.

These castings provide examples of products which must be submitted to performance tests under a variety of service conditions in order that a true perspective of nodular-iron castings in terms of an engineering material can be developed.

THE WHITEHEAD IRON & STEEL COMPANY, LIMITED, announces the following changes in its executive staff:—Mr. E. Kenneth Hughes is to succeed the late Mr. William Brown in London, as from January 2, 1950. Mr. Hughes is at present commercial manager and a special director of the company. Mr. T. G. Rodger has been appointed commercial manager. He is at present with the Consett Iron Company, Limited. Mr. Robert Mills has taken charge of the Birmingham office, Mr. L. H. Perry having retired on account of ill-health.